

# POWERPLANT

## SUBWOOFER MODELS

PP-SW10E, PP-SW12E, PP-SW15E,  
PP-SW10H, PP-SW12H, PP-SW15H

**FUSION®**

## FUSION CULTURE

There's no point doing something if no one notices. We've always believed the way to make things happen is by getting noticed. From our product, to our demo cars, to our events, FUSION is about making some noise.

Now you are ready. Step out of the shadows and announce you've arrived in a world where the old limits are left behind. Where technology is creatively combined with the latest in product innovation. Where new levels of entertainment are delivered with outstanding performance and quality. Our development team create distinctively different products; subwoofers, amplifiers, speakers and peripherals that redefine what can be done in car audio.

Leave the old behind and push the limits of what can be achieved in car audio. Make some noise.

For more information about FUSION Car Audio visit our website at [www.fusionelectronics.com](http://www.fusionelectronics.com) or email [technical@fusionelectronics.co.nz](mailto:technical@fusionelectronics.co.nz)

## POWERPLANT

Explore the limits of car audio and PowerPlant will get you there. FUSION PowerPlant delivers accurate clear sound reproduction with real power. Push sound further than it's gone before, confident that PowerPlant products have been engineered, designed and manufactured to ensure consistent and reliable performance

To optimise your FUSION experience, we recommend you have your FUSION product installed by an Authorised FUSION Dealer. Please read the warranty policy, keep your purchase receipt and original packaging.

If after reading this manual you still have questions regarding this product, please contact Technical Customer Services via email [technical@fusionelectronics.co.nz](mailto:technical@fusionelectronics.co.nz)

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RECORD YOUR PRODUCT DETAILS HERE:

MODEL NUMBER \_\_\_\_\_ DATE OF PURCHASE \_\_\_\_\_

AFFIX RECEIPT HERE

**WARNING!** Audio Systems can produce sound levels over 135dB. Continuous exposure to sound pressure levels over 100dB may cause permanent hearing loss!  
Please watch for emergency vehicles as warning signals may not be heard. USE COMMON SENSE!

## **SUBWOOFER FEATURES**

FUSION subwoofers are low frequency drivers capable of delivering extremely high bass levels from small enclosures. In order to achieve the maximum performance from your new FUSION Subwoofer, please use one of the recommended sized enclosures that best suits your application. Sealed and vented enclosure sizes can be found in this manual.

### **BASKET**

PowerPlant Subwoofers feature a uniquely high pressure cast aluminium basket. Development of the PowerPlant basket allows rigidity and style for any custom install. Finished in a protective metal black paint and detailed with FUSION green enhancements, the basket displays impressive strength and style.

### **CONE ASSEMBLY**

Development of the high performance pressed paper cone, creates a dynamic low bass response and high power performance. The cone is diple pressed with PowerPlant super graphic, catering for style, strength and sound performance.

### **SPIDER**

In order to keep the cone assembly balanced and linear, FUSION has used green poly cotton flat spiders to reduce the mechanical distortion for better sound quality.

### **VOICE COIL**

PowerPlant Subwoofers use dual 4 ohm configuration. This allows a multitude of wiring combinations for your amplifier system (please see wiring configurations in this manual). PowerPlant Subwoofers utilise high temperature, multi wound black aluminium voice coils.

### **EXTENDED POLE PIECE**

Recognising that an increased linear magnetic field for the subwoofer encourages a better low frequency response, FUSION has extended the internal pole piece to achieve this. The extended pole piece also decreases distortion.

### **MOTOR STRUCTURE**

The motor structure is constructed from the highest strontium magnetic material and capped with an attractive FUSION back plate. This has enabled increased power handling and larger excursion. With the additional venting holes we assure consistently strong bass.

## SUBWOOFER THEILE/SMALL PARAMETERS

Subwoofer Parameters	PP-SW10E	PP-SW12E	PP-SW15E
MAX Power Rating (Watts)	750	900	1200
RMS Power Rating (Watts)	250	300	400
Coil Height (Hvc) (mm)	25	25	25
Compliance (Cms) (uM/N)	281.69	248.25	148.67
Cone Area (Sd)	31.41	49.09	80.42
D.C.Coil Resistance (Re)	1.81	1.82	1.79
Electrical Q (Qes)	0.46	0.39	0.56
Force Factor (BL)	9	10.38	10.9
Free Air Resonance (Fs)	31.02	27.64	28.94
Frequency Response (Hz)	25Hz – 500Hz	22Hz – 500Hz	23Hz – 500Hz
Gap Height (Hag) (mm)	8	8	8
Impedance (Nominal)	2	2	2
Inductance (Le) (mH)	0.26	0.27	0.3
Linear Excursion (X-Max Total)	26	28	28
Mechanical Excursion	8.5	8.5	8.5
Mechanical Q (Qms)	4.5	4.65	5.87
Moving Mass (Mms)	93.45	133.6	203.39
Sensitivity (dB)	86.5	88.5	89.5
Total Loudspeaker Q (Qts)	0.373	0.36	0.508
VAS (Litres)	39.48	84.94	136.55
VAS (CuFt)	1.39	3	4.82
Magnet Structure (Oz)	152	176	196
Total Loudspeaker Displacement (Litres)	5	7	11

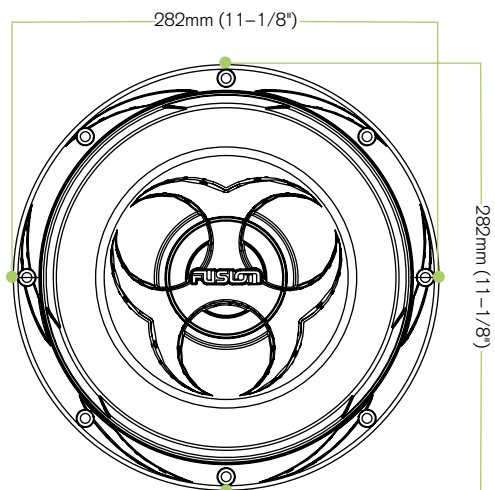
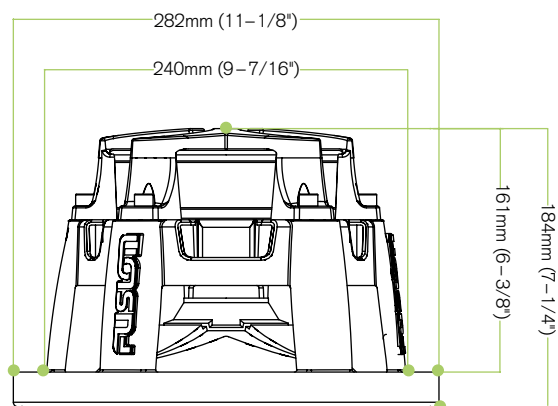
# SUBWOOFER THEILE/SMALL PARAMETERS cont...

Subwoofer Parameters	PP-SW10H	PP-SW12H	PP-SW15H
MAX Power Rating (Watts)	900	1200	1500
RMS Power Rating (Watts)	300	400	500
Coil Height (Hvc) (mm)	28	28	28
Compliance (Cms) (uM/N)	291.8	171	147.72
Cone Area (Sd)	31.41	49.09	80.42
D.C.Coil Resistance (Re)	1.75	1.85	1.75
Electrical Q (Qes)	0.41	0.411	0.457
Force Factor (BL)	8.88	11.61	12.08
Free Air Resonance (Fs)	29.62	31.02	28.28
Frequency Response (Hz)	25Hz – 500Hz	25Hz – 500Hz	23Hz – 500Hz
Gap Height (Hag) (mm)	10	10	10
Impedance (Nominal)	2	2	2
Inductance (Le) (mH)	0.29	0.34	0.33
Linear Excursion (X-Max Total)	28	30	30
Mechanical Excursion	9	9	9
Mechanical Q (Qms)	4.86	5.25	4.796
Moving Mass (Mms)	93.95	153.92	214.38
Sensitivity (dB)	86	88	90
Total Loudspeaker Q (Qts)	0.377	0.381	0.417
VAS (Litres)	40.9	58.52	135.67
VAS (CuFt)	1.445	2.07	4.79
Magnet Structure (Oz)	192	235	241
Total Loudspeaker Displacement (Litres)	5.3	7.3	11.3

## DIMENSIONS

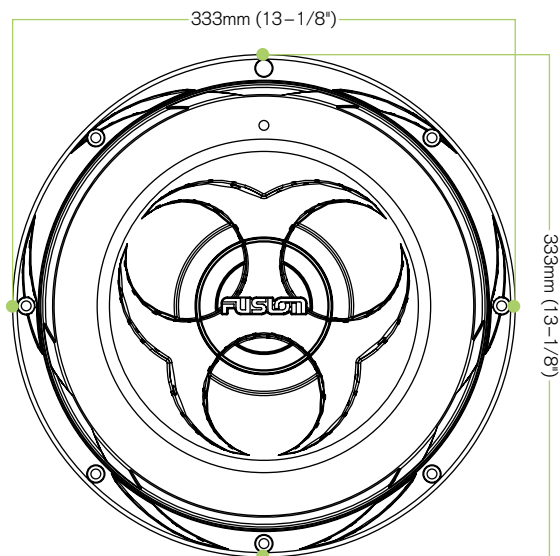
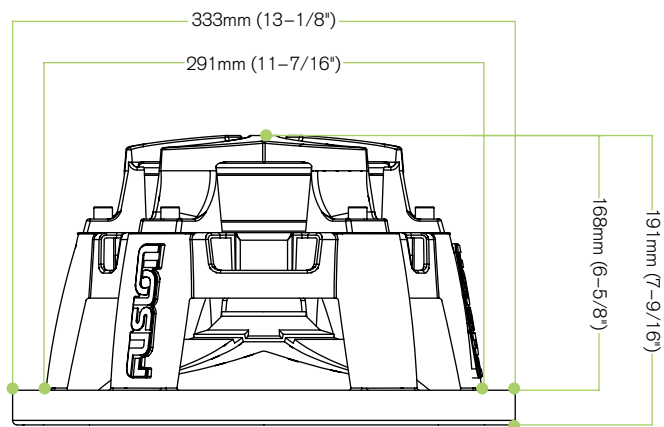
### SUBWOOFER

PP-SW10E



DIMENSIONS

SUBWOOFER PP-SW12E

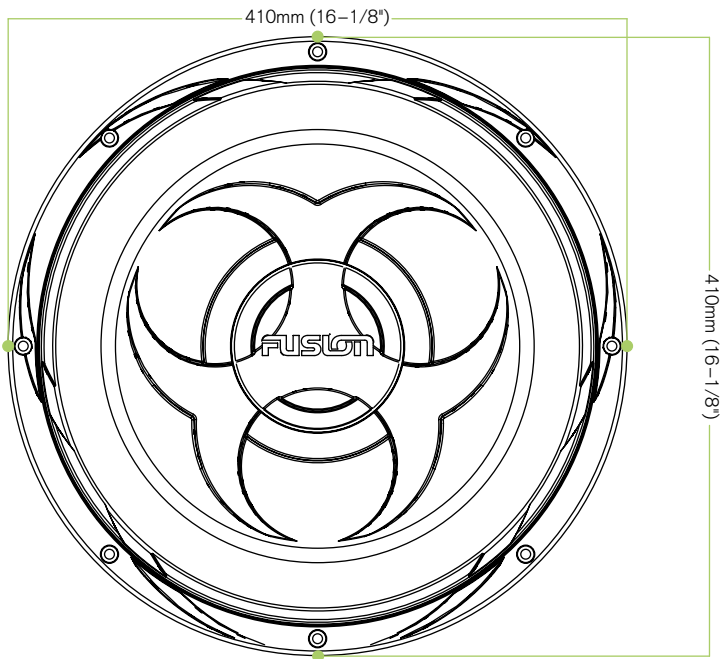
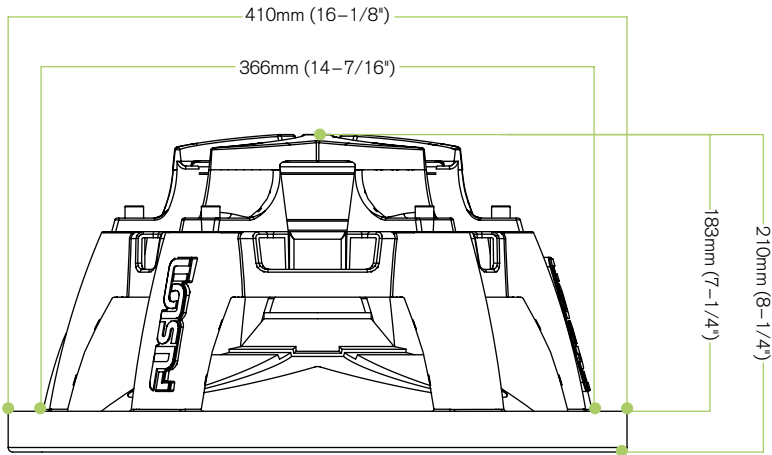




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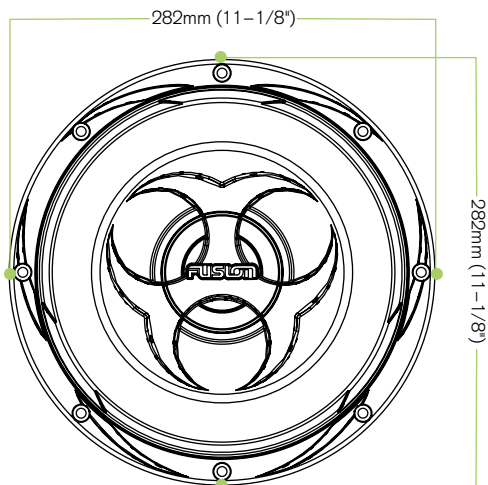
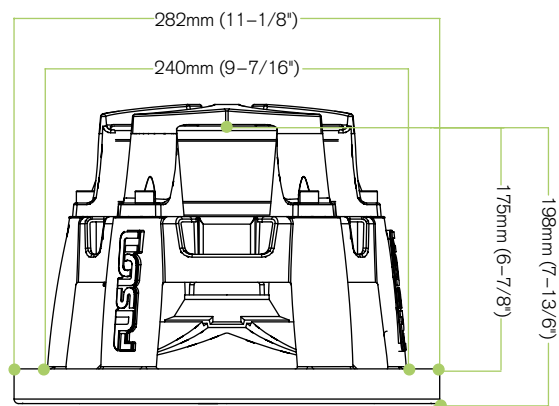
## SUBWOOFER

PP-SW15E



DIMENSIONS

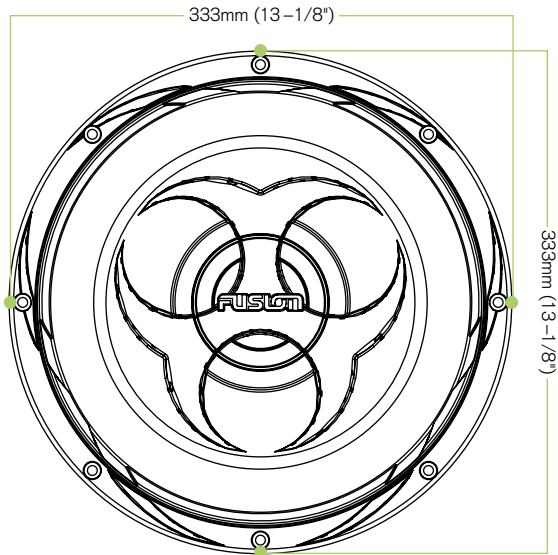
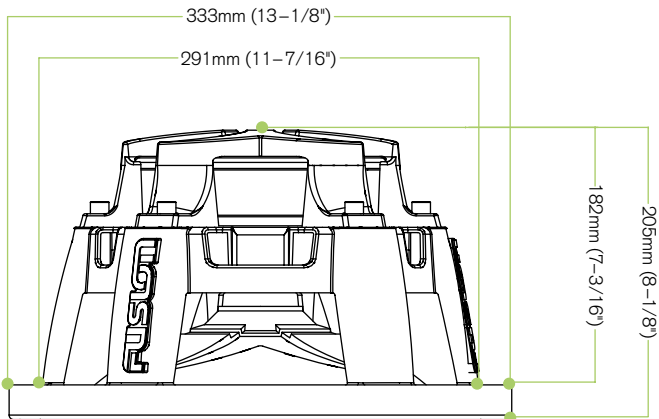
SUBWOOFER PP-SW10H



# DIMENSIONS

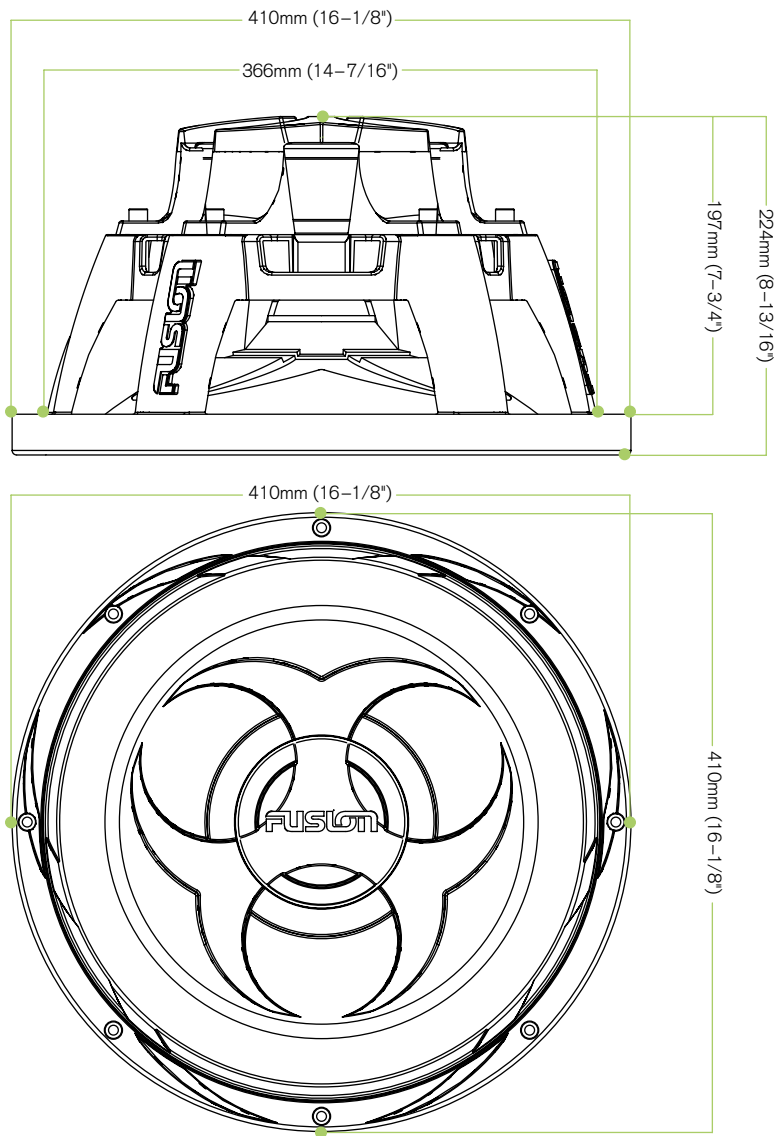
## SUBWOOFER

PP-SW12H



DIMENSIONS

SUBWOOFER PP-SW15H



## ENCLOSURES

All enclosures include port and subwoofer displacement. All ports are circle aero ports unless otherwise stated.

**Ported Enclosures:** A ported enclosure is generally larger than a sealed enclosure

**Sealed Enclosures:** A sealed enclosure will be the smallest enclosure you can build. It will have a tight low frequency response, but not as low as a ported enclosure.

## OPTIMUM ENCLOSURES

Ported	PP-SW10E	PP-SW12E	PP-SW15E
Volume (litres)	35.41	67.11	87.44
Volume (cu.ft.)	1.25	2.37	3.08
Port diameter (mm / in)	76.2mm / 3"	101mm / 4"	101mm / 4"
Port length (mm / in)	222.4mm / 8-3/4"	246.9mm / 9-3/4"	163.9mm / 6.7/6"
Tuned frequency (Hz)	36	35	34

Sealed			
Volume (litres)	25.8	58.9	72.2
Volume (cu.ft.)	0.912	2.08	2.55
Tuned frequency (Hz)	49	44	45

Ported	PP-SW10H	PP-SW12H	PP-SW15H
Volume (litres)	29.9	59.8	93.63
Volume (cu.ft.)	1.05	2.12	3.31
Port diameter (mm / in)	76.2mm / 3"	101mm / 4"	101mm / 4"
Port length (mm / in)	263.4mm / 10-3/8"	274.2mm / 10-13/16"	155.5mm / 6-1/8"
Tuned frequency (Hz)	37	34	33

Sealed			
Volume (litres)	25.7	50.6	71.14
Volume (cu.ft.)	0.907	1.6	2.512
Tuned frequency (Hz)	48	46	48

## ENCLOSURE CONSTRUCTION

All enclosures should be constructed from 18mm (3/4") Medium Density Fibre board. Enclosures should be glued and screwed, because MDF is porous. FUSION recommends sealing the internal sides with a polyurethane sealer prior to installation. To accurately cut the subwoofer hole use the unique FUSION ruler guide included inside the FUSION Subwoofer packaging

## ENCLOSURE PLACEMENT

An important factor is to place the subwoofer enclosure as far back in the vehicle as possible, so that the natural bass gain of the vehicle is utilised. If your vehicle is a hatch back, always experiment with which direction the subwoofer is facing. Facing the subwoofer towards the rear of the car, should enhance the low down bass that PowerPlant Subwoofers are designed to produce.

## ENCLOSURE TUNING

When tuning the system it is always a good idea to try running the subwoofer out of phase (which means switching the speaker wires around) with your other speakers. Do this and listen to the system to see if the perception of bass is more from the subwoofer location or the front speaker location. Which ever way gives the better perception that the bass is coming from the front speakers, would quite safely guarantee the subwoofer is wired correctly.

## CALCULATING ENCLOSURE 'BOX' VOLUME

### Cuft:

To calculate Cuft multiply the height (A), width (B), depth (C) in inches, then divide that number by 1728.

Example: 10" high x 18" wide x 12" deep = 2160 inches<sup>3</sup>

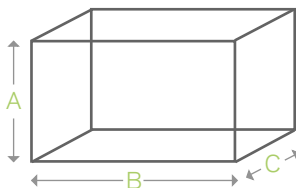
Divide 2160/1728 = 1.25 ft<sup>3</sup>

### Litres:

To calculate Litres, multiply the height (A), width (B), depth (C) in centimetres, then divide that number by 1000.

Example: 25.4cm high x 45.72cm wide x 30.48cm deep = 3539cm<sup>3</sup>

Divide 35396/1000 = 35.39 litres



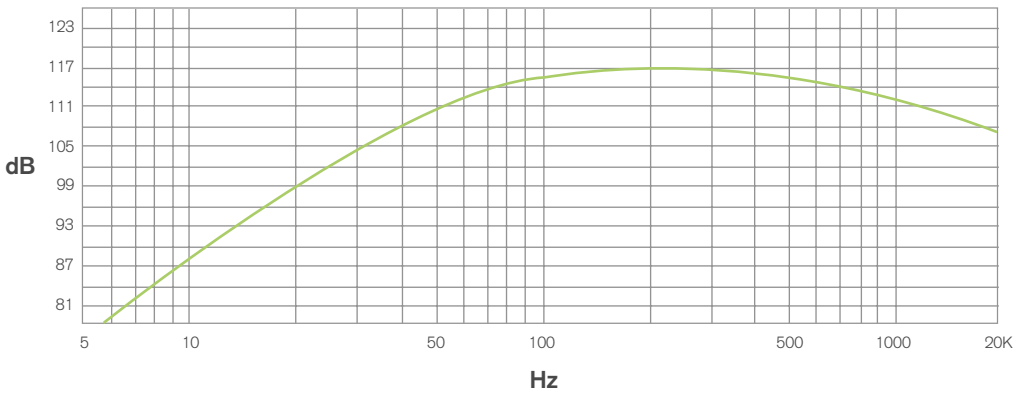
# ENCLOSURE TEST CURVES

SUBWOOFER

PP-SW10E

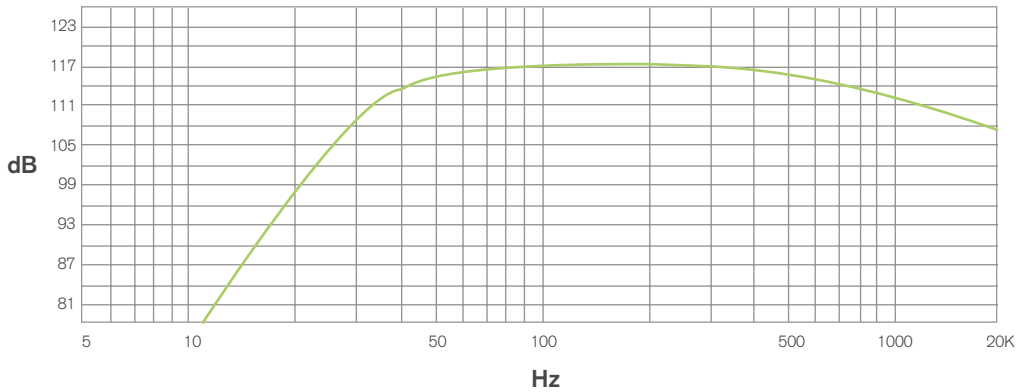
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 750 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 750 watts

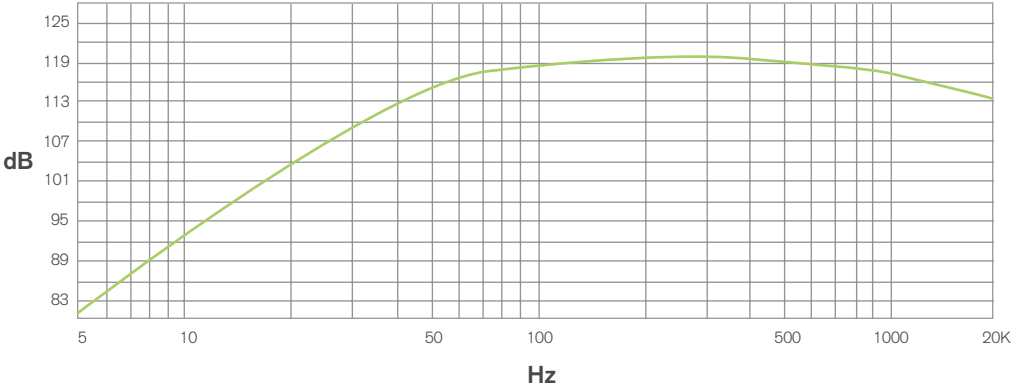


# ENCLOSURE TEST CURVES

SUBWOOFER PP-SW12E

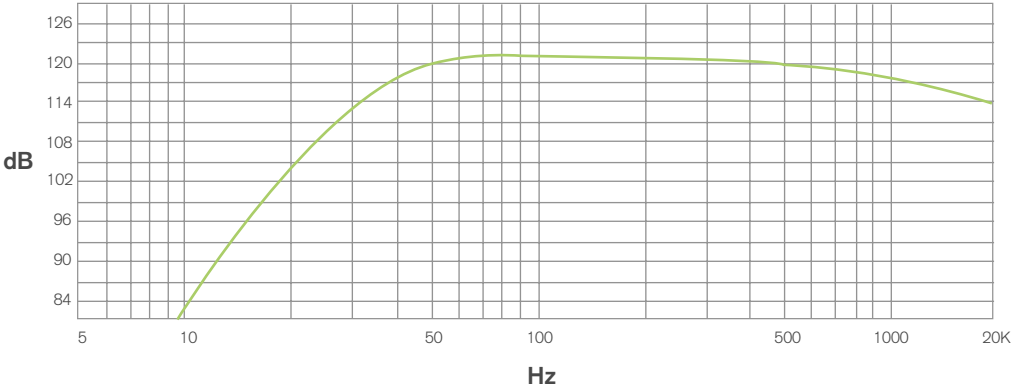
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 900 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 900 watts





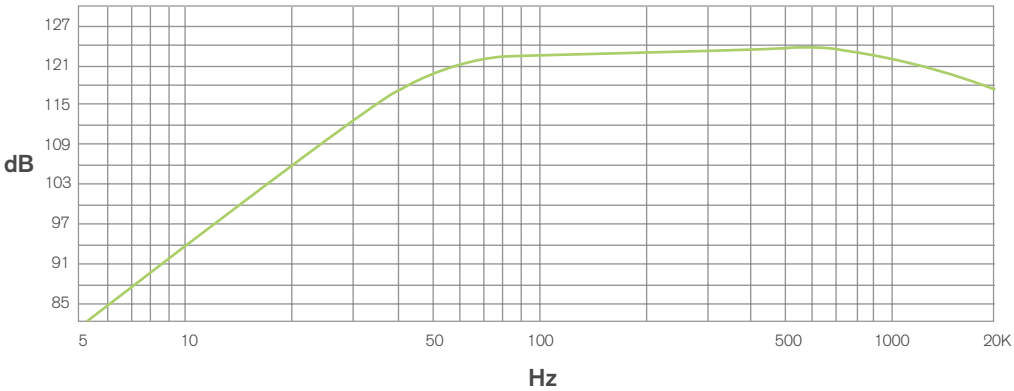
# ENCLOSURE TEST CURVES

SUBWOOFER

PP-SW15E

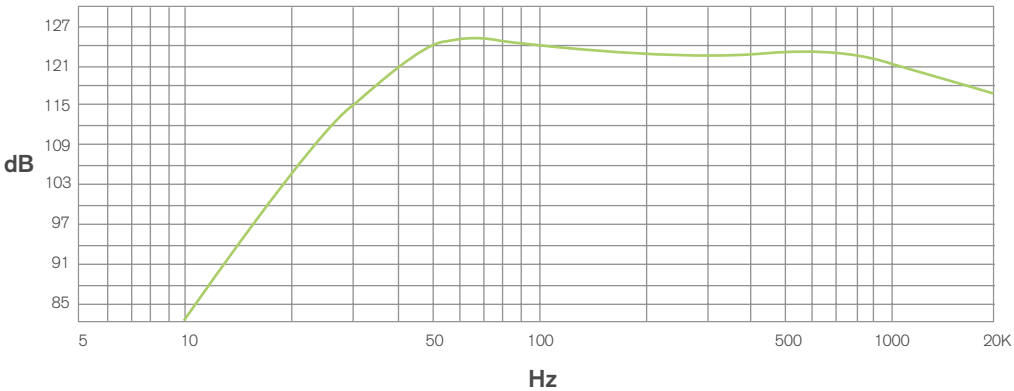
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 1200 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 1200 watts



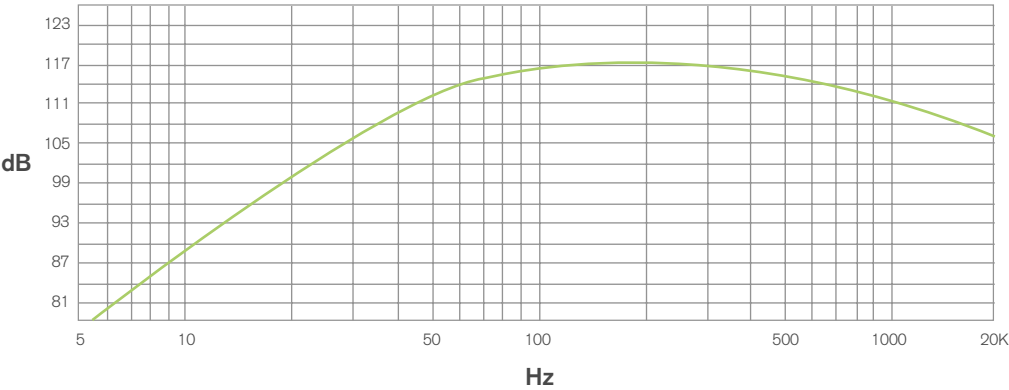
# ENCLOSURE TEST CURVES

SUBWOOFER

PP-SW10H

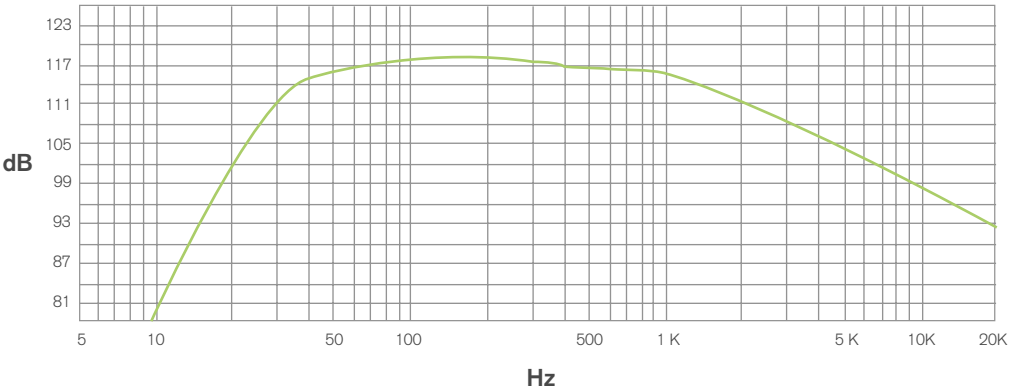
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 900 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 900 watts



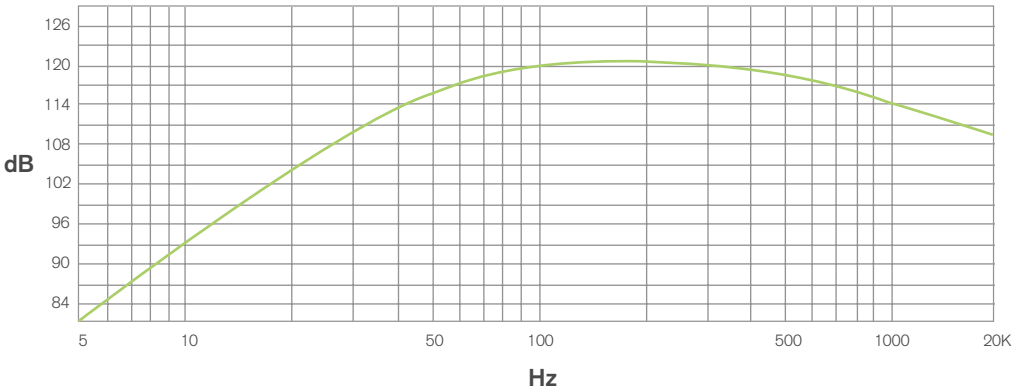
# ENCLOSURE TEST CURVES

## SUBWOOFER

PP-SW12H

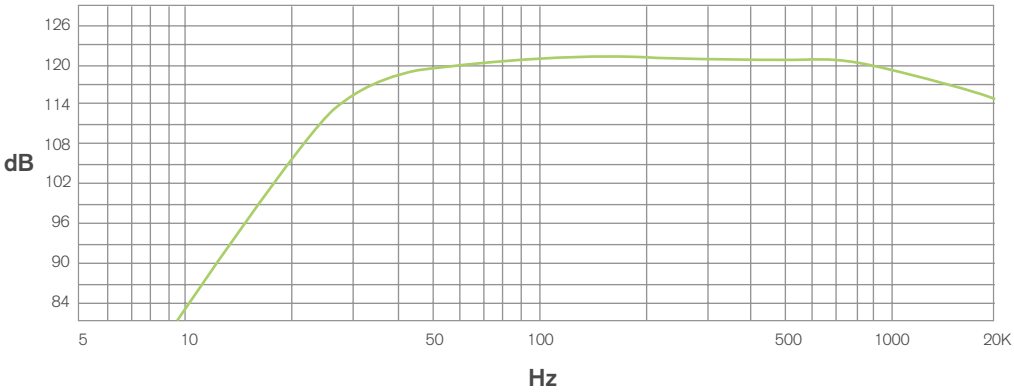
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 1200 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 1200 watts

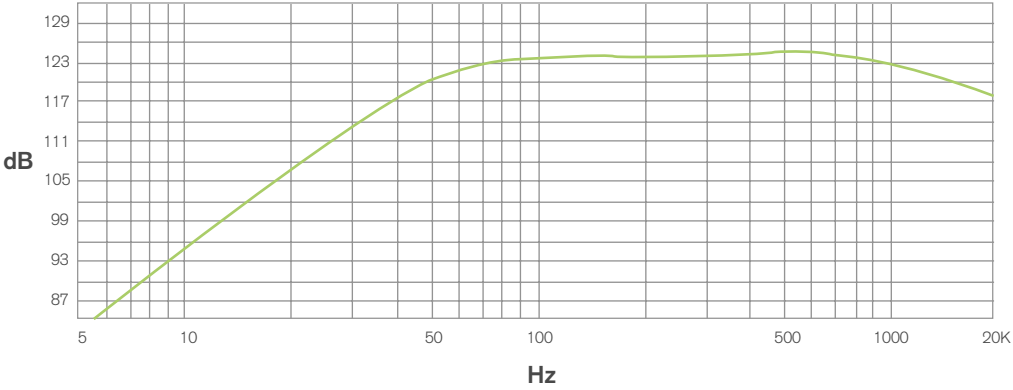


# ENCLOSURE TEST CURVES

SUBWOOFER PP-SW15H

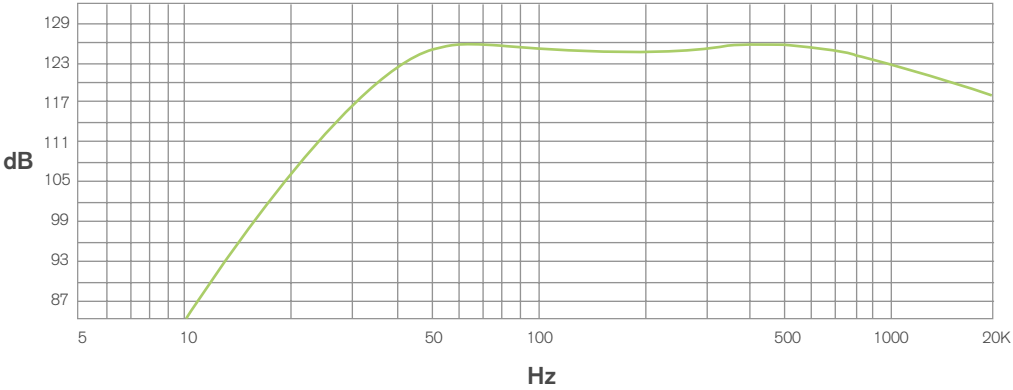
SEALED

Amplitude Response (dB-SPL/Hz at 1 m) with 1500 watts



PORTED

Amplitude Response (dB-SPL/Hz at 1 m) with 1500 watts



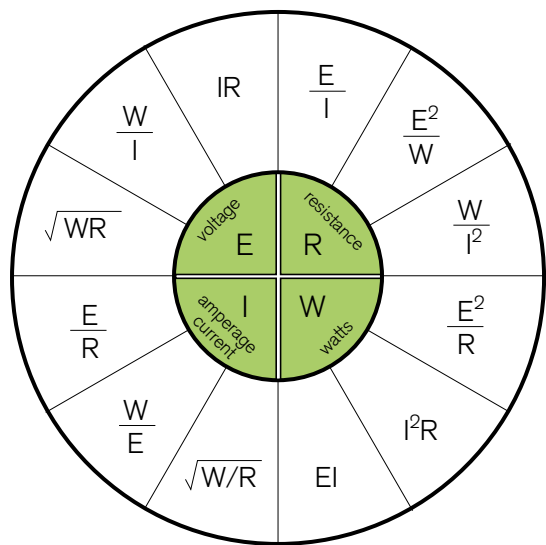
TECH TIPS

POWER CABLE CALCULATOR

TOTAL AMPERAGE	0-4 FT	4-7 FT	7-10 FT	10 -13 FT	13-16 FT	16-19 FT	19-22 FT	22-28 FT
0 – 20	14	12	12	10	10	8	8	8
20 – 35	12	10	8	8	6	6	6	4
35 – 50	10	8	8	6	4	4	4	4
50 – 65	8	8	6	4	4	4	4	2
65 – 85	6	6	4	4	2	2	2	0
85 – 105	6	6	4	2	2	2	2	0
105 – 125	4	4	4	2	0	0	0	0
125 – 150	2	2	2	0	0	0	0	0

The above chart shows cable gauges to be used, if no less than a 0.5 volt drop is acceptable. If aluminium wire or tinned wired is used, the gauges should be of an even larger size to compensate. Cable gauge size calculation takes into account terminal connection resistance.

OHMS LAW SIMPLIFIED



## SUBWOOFER RULER GUIDE

Use the FUSION ruler guide to create a perfect subwoofer mounting surface.

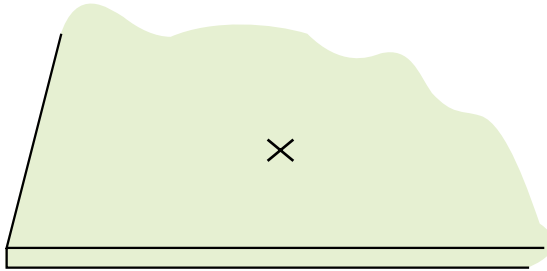


Fig. 1

- 1: Mark the centre position on the MDF (Medium Density Fibre) board where the subwoofer is to be mounted.

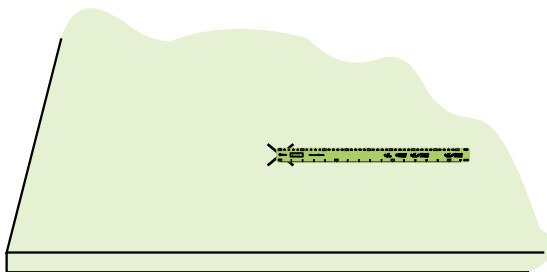
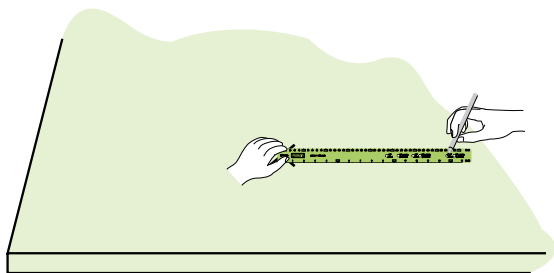


Fig. 2

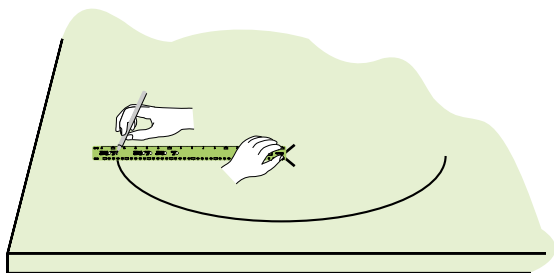
- 2: Fix the first hole (centre) to the marked out position on the MDF.

Fig. 3



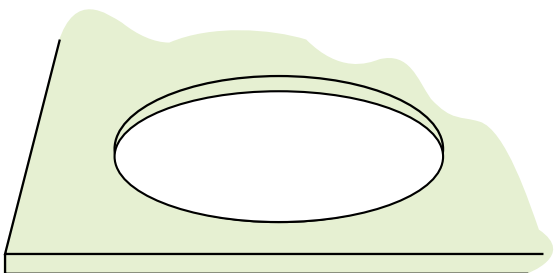
3: Insert a pencil into the correct subwoofer cut out measurement. 10", 12", or 15".

Fig. 4



4: Scribe a perfect cut out diameter onto the MDF board.

Fig. 5



5: Using a jigsaw or router, cut out this measurement.

## SERIES AND PARALLEL SUBWOOFER WIRING FOR DUAL VOICE COIL SUBS

### Parallel Voice Coil Wiring (2 Ohm operation)

To wire a DVC subwoofer in parallel (to get 2 Ohms), use two short pieces of speaker wire and link the positive from one coil to the positive of the second coil, and do the same for the negative as shown in fig 1. Then wire the amplifier to opposite sides of the subwoofer in order to equalise any connection resistance.



Fig.1

2 Ohm operation

### Series Voice Coil Wiring (8 Ohm operation)

To wire a DVC subwoofer in series (to get 8 Ohms), use one short piece of speaker wire and link the positive from one voice coil to the negative of the second coil as shown in fig 2. Then wire the amplifier to opposite sides of the subwoofer.

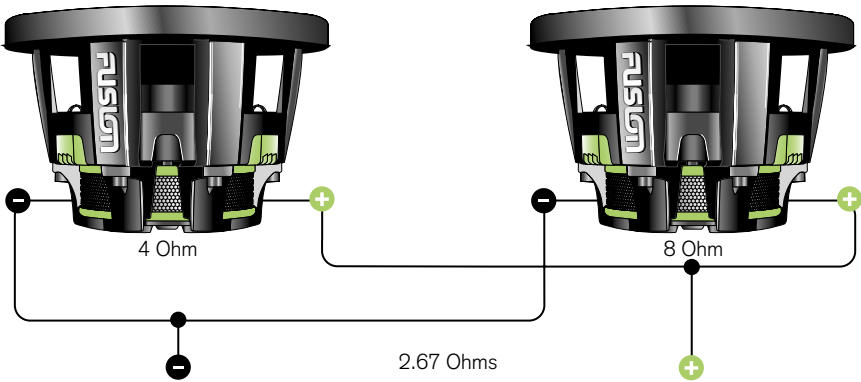


Fig. 2

8 Ohm operation



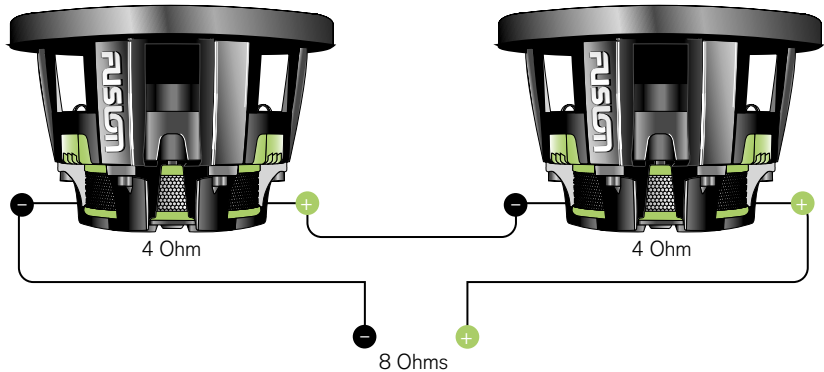
# PARALLEL WIRING FORMULA FOR 2 SPEAKERS



$$\frac{R1 \times R2}{R1 + R2} = \text{LOAD IMPEDANCE}$$

$$\frac{4 \text{ Ohms} \times 8 \text{ Ohms}}{4 \text{ Ohms} + 8 \text{ Ohms}} = \frac{32}{12} = 2.67 \text{ Ohms}$$

# SERIES WIRING FORMULA FOR 2 SPEAKERS



$R1 + R2 = \text{LOAD IMPEDANCE}$

## TROUBLE SHOOTING

No sound from your subwoofer: Check amplifier and wiring connections.

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Distorted sound: Check the connections from amplifier, processor or head unit.

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Subwoofer makes unusual noise in sealed enclosure: The enclosure may have leaks causing a lack of back pressure. Remove the subwoofer and ensure the enclosure is completely sealed. Use sealer and polyurethane to do this.

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Ported enclosure makes an unusual noise: Possibly due to incorrect port used. The correct term is chuffing, and to rectify this you will need to increase the port area. The diameter will need to increase and the port length will need recalculating.

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Bad smell: If you smell a burning smell, then chances are the subwoofer has been damaged. This can be due to the enclosure parameters being incorrect, too small an amplifier used and the subwoofer is receiving unwanted clipped signals or the music choice has enhanced bass notes played for long periods of time. Check the enclosure volume used and ensure the subwoofer is receiving clean audio signals from the amplifier.

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Vehicle rattles: The best way to solve this problem is to add sound deadening material to the steel panels of your vehicle. Ensure all screws and plastic panels are affixed firmly.

## INSTALLATION WARNING

- 1: Ensure the vehicle 12 volt lead is removed before any equipment is connected.
- 2: Investigate the vehicle's gas tanks, brake lines and electrical wiring locations before you begin installation.
- 3: Attach the product securely to the vehicle to prevent damage in the event of an accident.
- 4: Ensure all wiring is protected to avoid damage or pinching of the cables.

[illegible]

27



Specifications and design are subject to change without notice.